

Environmental Quality Assessment of Dairy Products Manufactured in the Area of Kazakhstan Aral Sea Region

Assylbekov BZ^{1*}, Tenlibayeva AS¹, Konysova SS¹, Bozhbanov BZ¹, Yermekbaeva RZ¹ and Auezov M²

¹South-Kazakhstan State University, Kazakhstan

²Ministry of Education of the Republic of Kazakhstan, Kazakhstan

Abstract

Aral problem, as the largest environmental disaster the world has acquired acute. This crisis affects the interests of all countries in Central Asia, which is becoming a concern of the world community. In this context, innovative research on the quality and safety of animal products in environmentally disadvantaged areas of the Kazakhstan part of the Aral sea region, is very relevant. One purpose was to conduct scientific research on the presence of heavy metals in the dairy products produced in the farms of the Aral and Kazalinsk areas of the Kyzylorda region of Kazakhstan. It was found that the quality of dairy products compared with the standard rate only slightly reduced and priority objectives for environmental health in the region, are the realization of projects for the system water allocation pools, as well as regulatory measures zones of the Syrdarya river, Recover and preserve the natural background of vegetation and disturbed the balance of the land.

Keywords: Ecology; Quality; Safety; Pollution; Composition; Milk production; Animal livestock

Introduction

Desertification (sahara) and drought takes is unique among today's global problems impeding sustainable economic development, which is reflected in an international instrument of the United Nations "Agenda day on 21st century".

Desertification (sahara) prone areas and potentially dangerous against desertification, which is due to irrational use of natural resources in arid land and take in the world more 52 mln. square km², and a financial loss from desertification, excluding losses from the drought are estimated at 44 billion US dollars annually. The fact is that in recent years the climatic conditions in the countries of Central Asia vary [1], in connection with a decrease in most mountain glaciers of the Tien-Shan and Pamir-Alay in the south and drying Aral Sea in the north. In this regard, I have really felt the lack of water for irrigation, irrigation of pastures; degraded natural vegetation cover, intensified erosion and salting, reduced the productive capacity of agricultural land, consequences of the Aral disaster in Central Asia, have long gone beyond the region [2]. Before humanity is an urgent problem - the preservation of the existing natural landscape resources, the preservation of their quality structure, while improving and reproduction single her views (Figure 1).

To solve the problems Aral sea region by the Government of the Republic of Kazakhstan at the time had adopted a program to comprehensively address the crisis in the Aral sea region 2004-2006



Figure 1: Last Aral sea shoreland.

and 2007-2009, aimed at implementing a series of measures to improve the environmental, commodity, economic and social factors that influence on the level of quality of life of local people. The most effective and large-scale project aimed at improving the environmental and socio-economic situation in the Kazakhstan part of the Aral sea region within the framework set by the program became a national project agreed with all the countries of Central Asia "Control of the Syrdarya and Northern part of Aral Sea".

Kazakhstan part of the Aral sea region, mainly located in the arid and semi-arid zones. Recent mastered thanks to the development of livestock here, the breeding of specific industries Karakul, camel, horse breeding and beef cattle. It solved the big key tasks as food sovereignty, security light industry raw materials of its own production and finally the socio-economic problems of the population in these zones.

Relevance of the work is determined by the urgent need to develop a national system of guaranteed safety of raw milk and finished products were consumed which increases their competitiveness in the domestic and foreign markets, as well as the fact that the most important step in the successful implementation of the tasks is the development of modern approaches to the harmonization of existing local and international standards and requirements on the content of natural and man-made toxic chemical contaminants in raw milk production areas in order to create modern technologies of competitive products according to international standards of quality and safety.

The fact that among the most common and dangerous pollutants

***Corresponding author:** Assylbekov BZ, South-Kazakhstan State University, Index 160012, South Kazakhstan Region, Shymkent city, Tauke Khan avenue, House N5, Kazakhstan, Tel: 87014991034; E-mail: assylbekov_516@mail.ru

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for “gains” ecological environment refers heavy metals (TM). They are characterized by high toxicity, mutagenic and carcinogenic effects [3].

The object of study of our work is the main raw material zones of commercial farms sold the cow and camel milk of Aral and Kazalynsk district of the Kyzylorda region is considered one of the most environmentally friendly places unfortunate Aral sea region. The first priority is to develop and conduct a scientifically based analysis of toxic substances in the block system “soil-milk”, as well as the testing of highly –methodic identify hazards in the form of chemical pollutants milk.

Special investigations identified the dominant group of diseases that are dependent on the same environmental factors. Among them, intestinal infections, diseases of the digestive system and digestive tract, iron deficiency anemia, Salmonella infections, dysentery, intestinal bacterial infections, enteritis, bacterial food poisoning. The region is a significant excess of maximum permissible norms of heavy metals, nutrients and organic matter to the floodplain of the Syrdarya River, as well as heavy metals such as zinc.

In soil ecological zone Aral sea region of heavy metals, especially firmly fixed in the upper gummosis consisting horizon or the most fertile part of the soil, and is a kind of natural bottom provides: life - food. Last, while the target of pollution, which are conductors entering a large number of metals in animals and humans [4].

An analysis of available studies [5], on pollution of individual objects agro-industrial complex of Kyzylorda region, indicate a sufficient study of this issue, however, there are some conflicting reports about the content of the soil in the region of heavy metals, chemicals and nucleotides. The fact that, unlike the organic compound is not destroyed by the toxic elements in the soil and the water, but only pass from one compound to another.

Long-term observations established [6,7] that the rational organization of the use of vegetation can maintain their productivity, and the irrational - the degradation and desertification as a result is a landscape.

In addition, the content of heavy metals in the soil, have a direct impact on the intensity of plant cover and is reflected in the subsequent food chain - animals - human health. However, the natural concentrations of heavy metals in the soil is firmly connected to its constituent parts, difficult to plant and do not adversely affect, but as soon as conditions allow heavy metals go into the soil solution, there is a direct danger contamination.

Methods

The relevance of the proposed work is determined by the need to develop a system of guaranteed security of production of raw milk and finished products. The purpose of this work- to assess the production of dairy products produced in environmentally disadvantaged households Aral and Kazalinsk district of the Kyzylorda region of the Aral sea zones.

The objects of study are the chemical soil and cow and camel milk farms “Islambek” and “Bereket” Aral and “Arzhikov B” and “Jenis” Kazalinsk districts of the Kyzylorda region. Selecting the direction of the proposed research is determined by the need to develop a set of measures to ensure guaranteed safety of livestock production in the ecologically unfavorable area south of Kazakhstan Aral sea region.

Chemical evaluation of the quality of milk on the content of heavy

metals, we carried out by atomic absorption electrometric method, while comparing these data with the regulatory indicators [8].

In addition, a special technique was used to assess the safety and quality of food [9]. Here, in each case, according to the analyzes of samples and methods of the study, we were taken individually by each administrative - economic area. To determine the presence of heavy metals in samples of the analysis methods used, installed State Standards (ST Standard 17.13.04.-82; ST Standard 26927-34-86).

Guidelines for electro thermal atomic- absorption determination of heavy metals (CH, Pb, Zn., Al., Cu, Mn, Cu, Cr, Ni, and beryl), as well as the recommendation of the Ministries of Health and Agriculture of the Republic of Kazakhstan.

There have also been applied for the management of food quality and methods of their determination, with simultaneous use of guidelines for the assessment of the safety and quality of food [10].

Results

In the area of environmental crisis Kazakhstan Aral sea region includes the entire territory of Kyzylorda region and the city of Baikonur, including the towns within its administrative-territorial subordination. The zone of ecological disaster, most livestock farms are located close to the Aral and Kazalinsk districts of these regions.

The latter allows in livestock farming in contaminated areas directly on farms and knows to predict performance standards implemented dairy products and to develop a set of measures to reduce the revenue of toxic elements in the body of animals and products.

On the north-western part of the Kyzylorda regions of Kazakhstan, on the square 57 and 45 thousand sq.km. located Aral and Kazalinsk districts, most near located of the Aral Sea. In this regions quality of settlement peoples - 57 and 45, distance to the regional center Kyzylorda city 448 and 382 km, with administrative centers Aralinsk city and village Aiteke -bi.

On the territory of the Aral region it is a located large part of the Aral Sea region and both are within the arid and semi-arid cones in some places of the country. The climate is sharply continental: the average winter temperature in the daytime is 5-7 degrees at night - 20-25 degrees and the lowest 42 degrees. The value of the average snow cover reaches 10-15 cm (Sometimes up to 30 cm). Summer takes place against the backdrop of hot and dry weather. The air temperature during the day is an average of +30 ... + 41 degrees at night the air cools down to +19 ... + 23°C., With accompaniment often causing severe dust storms that can last for several days.

In the research zone of the natural winds are mainly in spring and summer - the western and north-west, and in the fall and winter - the eastern and north-eastern. Prevailing wind speed of 3-7 m/s. Throughout the year there are sometimes strong storm winds with a speed of 15 m/s or more (25 days). However, the southern part of the Aral sea region, in the part of Aral and Kazalinsk, Shieli district of Kyzylorda region, located in the most part in the desert zone Kazakhstan. Recent mastered thanks to the development of livestock here, the breeding of specific industries Karakul, camel, horse breeding and beef cattle. There are solved more key tasks such as food sovereignty, maintenance of light industry raw materials of its own production and finally the socio-economic problems of the population in these areas. On this basis, priority areas of science in the dairy industry is the solution of problems of quality, ecology, dairy products, the competitiveness of domestic products through the implementation of quality systems and

certification of compliance with international standards, as well as the creation of an effective monitoring system in the areas of raw material milk production by region Kyzylorda region. Therefore, the quality of milk and dairy products definite by specific requirements, and in violation of sanitary rules, they can become a favorable environment for the development of pathogens agents of a number of infectious diseases.

The fact that the decision of this problem is a comprehensive approach to the assessment of safety and the degree of environmental load of livestock production close to the Aral Sea regions and farms of the region, as well as in the development of acceptable technological methods, allowing significantly reduce the migration of toxicants in the natural chain: soil-plant-animal-feed products. As these livestock farms are annual soil degradation and solution of land and a sharp reduction in livestock grazing lands (Figure 2).

In this regard, the system of quality ensure the protection of animal health and benefiting from a good-quality products, require the use of complex agro-technical and organizational measures, based mainly on the use of animals benign pasture plants. This pride of place must belong to a comprehensive analysis that will identify and control the content of standardized toxicants in pasture plants and feed on the basis of which should be conducted to assess the safety eat plants, the diet of the animals on set present in the radionuclide, followed by forecast obtain quality products from animals that meet sanitary requirements. The fact that here a simple compliance of the content of heavy metals in the plant and livestock diets may not provide the full extent of obtaining a guaranteed environmental assessment of the safety of products. Therefore, need reliable criteria for evaluating the quality of milk products produced on the content in them is the presence of heavy metals.

Special studies indicate that soils farms Aral and Kazalinsk districts



Figure 2: Development of livestock farms in the Aral region.

on the content of elements such as copper, zinc, lead and cadmium have a deviation from the norm, in the direction of a small accumulation: Zinc – 25- 26, Copper - 3.6-3.9, lead - 40-42, cadmium - 0.1. One of the many reasons influencing the decline in the quality of animal products produced is soil contamination by heavy metals. It was found that the migration of heavy metals is: soil, plants, and animals and through callas, urine, back into the soil.

Our observations revealed that the region in the lower reaches of the Syrdarya more 114 thousand hectare alluvial soils have become saline and 56 hectares of marsh and meadow marsh plants, including licorice, one grasses disappeared. In the upper layer of soil accumulation of heavy metals indicate the ability of organic substances to the black earth of their accumulation, as well as shows on their entry in the polluted atmosphere. The most serious danger it is soil pollution by cadmium, which adversely affects the health of animals and humans. During the summer season, in pahatnom soil studied farms the level of mobile forms of heavy metals leads to their ability to easily transition into the water and plants, which is very dangerous for animals and humans. During the work, we have taken samples for chemical study on the presence of heavy metals in products sold dairy farms Aral and Kazalynsk district of this regions (Table 1).

As can be seen from Table 1, the presence of heavy metals in the milk of various species implemented in regions ecological disaster of the Kazakh Aral sea region, in general, meet acceptable standards ST of RK 166-97 «Camel milk» (shubat) and ST of RKK 52054-2003 «Cow milk». However, the presence of lead in bovine milk turned comparative less, whereas camel its content was somewhat higher (0.1-0.3). A similar increase is observed on other types of heavy metals. The latter feature is associated with this type of grazing animals. If the results of our analysis it is encouraging that the presence in the milk of animals of the toxic metal in natural ecosystems, such as mercury are found, then the trace metal cadmium (0.015-0.07), copper (0.8-1.4) and lead (0.08-0.25) where there is a slight deviation from the allowed rate (0.03; 1.0; 0.10).

Accumulation of heavy metals in the upper soil horizons says about the ability of organic compounds to their accumulation black land and also indicate the source of the heavy metals in polluted atmosphere. Soil pollution by cadmium should be regarded as the most serious threat to animal and human health. We have found that the soil layer farms pahatnom level of mobile forms of heavy metals in the summer period is increasing. This is especially true for copper, zinc and lead, while the content of cadmium tends to decrease. The presence of mobile forms of heavy metals leads to the possibility of transition of these elements in water and plants; it is dangerous for animals and humans.

The fact that at present the study farm soil composition is poor

No.	Types of metals	Permissible norm	Aral region				Kazalinsk region			
			Peasants farm "Bereket"		Peasants farm "Islambek"		Peasants farm "Zhenis"		Peasants farm "Arzhikov B"	
			Milk (Caw)	Shubat (camel)	Milk (Caw)	Shubat (camel)	Milk (Caw)	Shubat (camel)	Milk (Caw)	Shubat (camel)
1.	Zinc	2,0	1,8	2,1	1,5	2,0	1,6	2,0	1,6	2,0
2.	Copper	1,0	1,4	1,3	1,2	1,1	1,1	1,0	0,8	0,90
3.	Lead	0,10	0,22	0,25	0,20	0,23	0,10	0,13	0,08	0,12
4.	Cadmium	0,03	0,07	0,04	0,06	0,04	0,03	0,02	0,015	0,016
5.	Quicksilver	0,005	non	non	non	non	non	non	non	non
6.	Arsenic	0,05	0,023	0,021	0,025	0,021	0,023	0,023	0,023	0,024

Table 1: The presence of heavy metals in milk farms and Aral Kazalinsk areas Aral sea zones.

in organic compounds, where the predominant chloride, sulfate, and mixed types of salinity. Recent fluctuations in the level ranged from weak to very strong salinity. Indicator organic content (humus) is very low and does not exceed 1.8%, and subsequently it rapidly depletes the soil, turning it into a saline formation, which is clearly seen in Figure 3.

The research studies have shown that the use of the rational organization of vegetation, you can save their productivity and the irrational use, there is its degradation and desertification as a result is a landscape. It is also found that decreasing here grazing and degree of desertification is: average - 25% and stronger - 16%. The nearby livestock farms ecologically unfavorable territories Aral Sea region of Kyzylorda oblast, with the intolerable human impact on natural rangeland plants, there is the growing process xerophytization, habitats of plant species, which ultimately leads to their complete disappearance. Therefore, you must conduct a series of organizational work on the adjustment of crop planting, hay-pasture rotation administered, the necessary agro-technical measures, to limit the grazing of animals on overgrazed areas, sow perennial grasses, drawing proper diet feeding and constantly monitor the quality of animal livestock products.

Livestock Aral and Kazalinsk districts' of the Kazakhstan Aral sea region mainly engaged in breeding of karakul breed of sheep. As a result of our study, it was found that the environmental situation in the region still has a negative impact not only on the health of animals, in particular on biological parameters here farmed karakul sheep. The results of special investigations have shown that in recent years the constitution of karakul sheep has become somewhat effective, while performance efficiency of animals slept much. For example, the quality of astrakhan curls shine and silkiness, the quality of hair and other indicators are to the downside, karakul pelts decreased grade than it was in previous years.

One of the many reasons influencing the decline in the quality of animal products is environmental pollution, lack of agrarian formation event of natural fauna and the presence of agricultural resources (soil, water, food) content of heavy metals.

Discussion

In his theories of the "principles of harmonization cycles" believe that finding the best possible promptness of anthropogenic and natural around matter and energy, as breed often removes from geochemical around toxic salts, keeping their in deeply formations or semi geological formations, and intensify their people, using irrigation and drainage, "prints" the warehouses, which leads to soil salinity, pollution of river water and everything else.

Growth of high quality livestock production farms Aral sea region,



Figure 3: The salt of the earth formation.

requires, along with an increase in productivity of livestock, and also increase the space allotted for forage crops, pastures and by the natural environment. Currently, close to the Aral Sea breeding farms, the area of rangelands 70% degraded in a separate degree, with limited views of desert plants are suitable only for breeding are specific livestock industries that are adapted to survive in the desert herding (camels, Karakul sheep a lesser degree of beef cattle) directions.

In this case, the reasons for pasture degradation of the objects is a consequence of the constant wind erosion, lack of forest plantations, the irrational use of pastures and grazing livestock density mismatch, which ultimately hinders the ability to regenerate pastures. Although in recent years, by the administration of the Aral zone of Kyzylorda region there are certain developments and events are held on planting windbreaks, where an area of 800 hectares has begun planting seedlings in the amount haloxylon 29600 units to further increase plant seeds and their subsequent transplantation. However, this is not enough, and work should rapidly fast temps.

Rangelands farms culture of the Aral and Kazalinsk districts of Kyzylorda region of the Aral sea zones is now in the position of ecological disaster. There is the presence of the poor assortment of pasture plants, with low yields and nutritional value of feed eaten.

The main range of environmental issues livestock administrative regions Aral sea region, is associated with a significant depletion of water resources. Recent cause solemnization and desertification of territories and strengthening of wind erosion. Most of the Aral and Kazalinsk districts composed of sands and soils of light mechanical composition, which are involved in wind transport. During dust storms and salt change radiations background and composition of the soil and climate of the region at the same time. The deposition of salt dust leads to soil solemnization and reduction of the natural potential of the land.

The main cause of desertification is intensive, the impact of environmental and drying Aral Sea. With the dry area of the sea each year, both from the volcano spread over 110 thousand tons of salt and fine dust with impurities of various chemicals and poisons, adversely affecting all life. An important factor is the salinity of frequent wind and salt transfer from dried bottom of the Aral Sea on the territory of the land in the surrounding farms of southern Aral sea zones (Figure 4).

Thus, on the territory of Kazakhstan supplied more than 63 thousand tons of solid dust aerosols a year. Its impact on the environment Aral sea zones every year gradually increases. The effect of pollution is amplified by the fact that the Aral Sea is located in the path of a powerful jet stream of air from west to east, promoting removal of aerosols in the upper atmosphere. In addition,



Figure 4: The flow of wind from the Aral Sea once bearing salt and fine dust.

the degradation of the environment and prevailing here sandy deserts, which for years were subjected to excessive erosion, grazing, logging and poaching haloxylon throughout the Kazakhstan part of Aral sea region. The latter led to the formation of a new desert Aralkum that is a continuation of Karakum and Kyzylkum deserts. Enhancing this process may harm the health of people living in the area and reduce the quality of livestock production, also lead to deterioration biological diversity, climate change, acidification of soil and water, degradation of the ecological system of the biosphere. Since, on the territory of the Aral and Kazalinsk districts of the land is leased and private property must be urgently reconsider cropping patterns and crop rotations, which should be aimed at improving the fertility of rangelands.

Strengthening this process may harm the health of people living in the area and reduce the quality of livestock production, also lead to deterioration biological diversity, climate change, acidification of soil and water, degradation of the ecological system of the biosphere. Since, on the territory of the Aral and Kazalinsky districts of the land is leased and private property must be urgently reconsider cropping patterns and crop rotations, which should be aimed at improving fertility pasture land.

Conclusion

Presentation research work reveal the main types of natural anthropogenic pollution of soil, water and milk to determine the scientific approach to the technology of processing and producing clean milk production, methodical approaches to justify the regulation of hazardous substances in dairy products. To develop recommendations for the production of dairy products in environmentally disadvantaged areas Aral sea. Qualities of milk received directly dependent on the state of the rangeland and pasture composition, enjoyed by animals when they are grazing.

Analysis of the current state of rangelands farms Aral and Kazalinsk districts of Kyzylorda region of Aral sea zones, we have noticed the following undesirable trends: reduction nature pasture plant (cutting haloxylon, low forests, etc.). The use of grazing land for other purposes (under industrial construction and construction facilities to the city, regional centers); - deterioration pastures (desertification and sand dunes in the transformation, solemnization, drying and others.).

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